CONTENTS

List of figures
List of tables
List of graphs
List of published papers

CHAPTER 1
INTRODUCTION

1.1 Importance of speech
1.2 Role of speech in human communication
1.3 Uses of speech in different walks of life
  1.3.1 Linguistics
  1.3.2 Sociolinguistics
  1.3.3 Psychology and Psycholinguistics
  1.3.4 Phonetics
  1.3.5 Acoustics
  1.3.6 Medical field
1.4 Biological foundation of language/speech
  1.4.1 Speech production
  1.4.2 Speech rhythmicity
1.5 References

CHAPTER 2
BIOLOGICAL BASIS OF SPEECH PRODUCTION
AND ITS PARAMETERS

2.1 Productive mechanism
  2.1.1 Air-stream mechanism
2.2 The sensory basis of speech
  2.2.1 Lungs
  2.2.2 Breathing movements
2.3 The mechanisms of speaking
   2.3.1 The voice producing mechanism
   2.3.2 The articulatory mechanism
2.4 Acoustical parameters of speech sound
   2.4.1 Formants
   2.4.2 Male/female sound differentiation
2.5 References

CHAPTER 3
ANATOMY OF BODY DURING PREGNANCY

3.1 The thorax
3.2 The abdomen
3.3 The abdominal cavity
3.4 The uterus
   3.4.1 Reproductive changes in the uterus
   3.4.2 Supports of the uterus
3.5 The menstrual cycle
   3.5.1 Time of ovulation in relation to menstruation
   3.5.2 Importance of determining the time of ovulation
3.6 The placenta
   3.6.1 Functions of Placenta
   3.6.2 Normal site of implantation of ovum
3.7 Amniotic fluid
   3.7.1 Function of amniotic fluid at the time of labour
3.8 Umbilical cord
3.9 Mutual relationship of amniotic cavity and uterine cavity
3.10 The foetus
   3.10.1 Growth of foetus
   3.10.2 Physical representation of different stages of foetus growth
   3.10.3 Determination of the age of an embryo
### Chapter 3.11

**Physiological changes during pregnancy**

3.11.1 Uterus
3.11.2 Weight-gain
3.11.3 Factors influencing the weight-gain
3.11.4 Importance of weight checking

### Chapter 3.12

References

---

### Chapter 4

**Network theory of vocal transmission and inter-relationship with womb development**

4.1 Acoustical parameters of a speech system
   4.1.1 Inertance
   4.1.2 Acoustical capacitance
   4.1.3 Representation of electrical, mechanical and acoustical elements

4.2 Acoustical model of vocal tract

4.3 Development of two port electrical network of vocal tract

4.4 Electrical and mechanical model of womb
   4.1.1 Mathematical formulation of womb

4.5 Pregnant woman vocal tract electrical network
   4.5.1 Inter-relationship of womb with vocal tract

4.6 References

---

### Chapter 5

**Statement of problem and measurement**

5.1 Statement of Problem

5.2 Measurements
   5.2.1 Frequency measurement
   5.2.2 Amplitude measurement
   5.2.3 Time duration measurement
   5.2.4 Energy measurement

5.3 References
CHAPTER 6
RESULTS

6.1 Peak frequency measurement
6.1.1 Assessment of menstrual cycle 89
6.1.2 Determination of level of pregnancy 99

6.2 Formant frequency measurement
6.2.1 Assessment of menstrual cycle 112
6.2.2 Changes in formant frequencies during pregnancy 129
6.2.3 Assessment of foetus weight-gain and sex 145
6.2.4 Assessment of foetus length gain 155
6.2.5 Assessment of foetus width/thickness gain 156

6.3 Formant amplitude measurement
6.3.1 Formant amplitude behaviour in case of non-pregnant woman 162
6.3.2 Formant amplitude changes during pregnancy 171
6.3.3 Depiction of movement of foetus in womb 187

6.4 Time duration measurement
6.4.1 In case non-pregnant woman 195
6.4.2 Time duration characteristic with pregnancy 204

6.5 Energy measurement
6.5.1 In case of non-pregnant woman 216
6.5.2 In case of pregnant woman 218

6.6 Model representation
6.6.1 Development of model under pregnancy 221
6.6.2 Discussion of the model 238
CHAPTER 7
CONCLUSION AND SCOPE FOR FURTHER WORK

7.1 Conclusion

7.2 Scope for further work

BIBLIOGRAPHY

APPENDIX